

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 February 2003 (20.02.2003)

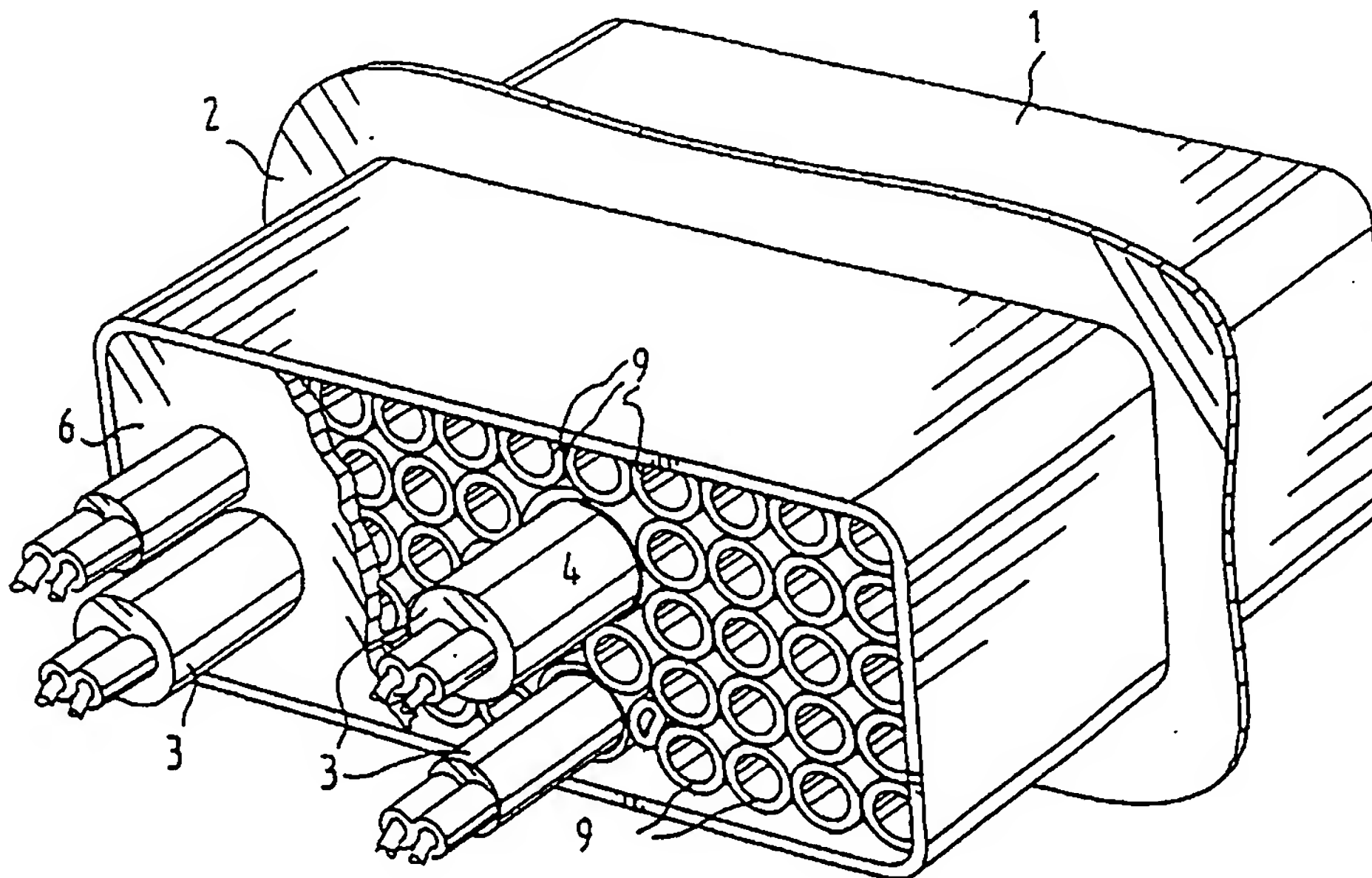
PCT

(10) International Publication Number
WO 03/013658 A1

- (51) International Patent Classification⁷: **A62C 3/16**, H02G 3/22, F16L 5/04
- (21) International Application Number: PCT/NL02/00529
- (22) International Filing Date: 6 August 2002 (06.08.2002)
- (25) Filing Language: Dutch
- (26) Publication Language: English
- (30) Priority Data:
1018722 7 August 2001 (07.08.2001) NL
- (71) Applicant (*for all designated States except US*): **BEELE ENGINEERING B.V.** [NL/NL]; Beunkdijk 11, NL-7122 NZ AALTEN (NL).
- (72) Inventor; and
(75) Inventor/Applicant (*for US only*): **BEELE, Johannes, Alfred** [NL/NL]; Beunkdijk 11, NL-7122 NZ AALTEN (NL).
- (74) Agent: **HOOVELD, Arjen, Jan, Winfried**; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK THE HAGUE (NL).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: FIRE-RESISTANT SYSTEM AND METHOD FOR PASSING AT LEAST ONE CABLE, TUBE OR THE LIKE THROUGH AN OPENING IN A WALL



(57) Abstract: A fire-resistant system for passing at least one cable, tube or the like through an opening in a wall, which system comprises a fire-resistant sleeve member comprising a continuous slit, which is at least partially arranged round said at least one cable, tube or the like, and which is at least partially installed in said opening, characterized in that the sleeve member can be placed in a position in which longitudinal edges of said slit overlap permanently under material stress.

BEST AVAILABLE COPY

WO 03/013658 A1



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

**FIRE-RESISTANT SYSTEM AND METHOD FOR PASSING AT LEAST ONE
CABLE, TUBE OR THE LIKE THROUGH AN OPENING IN A WALL.**

5

The invention relates to a fire-resistant system for passing at least one cable, tube or the like through an opening in a wall. The invention also relates to a method for passing at least one cable, tube or the like through an opening in a
10 wall, using the aforesaid system. Hereinafter, the term "wall" will be used for the sake of simplicity, whilst said term is understood to include other partitions as well, such as bulkheads, division plates and the like.

15 Such a system and such a method are known from European patent publication No 0 534 563 of the present Applicant. The bushing system that is disclosed therein consists of a steel bushing mounted in an opening in a wall, through which a number of cables, which may or may not be multiple cables,
20 are passed. Each cable is enclosed in a rubber sleeve member or hose member, whilst the remaining space in the wall opening is filled with similar hose members. Finally, the wall opening is sealed with a suitable sealing putty. The hose members are provided with a continuous slit so as to
25 make it easier to arrange the hose members round the cables that have already been drawn.

One drawback of this known system and this known method is that several sleeve members or hose members having varying
30 diameters are required if various types of cables having varying diameters are passed through the opening in the wall. After all, each type of cable diameter requires its own

corresponding type of hose member diameter. It stands to reason that the manufacture, the transport and the storage of various types of hose members is found to be laborious, whilst it must be determined upon installation at the building site which type of hose member fits which type of cable, which stands in the way of an efficient installation process.

The object of the invention is to improve the system disclosed in the aforesaid European patent specification in the sense that the drawbacks as indicated above are overcome.

In order to accomplish that objective, a bushing system of the kind referred to in the introduction is according to the invention characterized in that the sleeve member can be placed in a position in which longitudinal edges of said slit overlap permanently under material stress. The advantage of this is that one type of sleeve member or hose member will suffice in spite of the fact that different cable diameters are used. An important feature of the sleeve member, which is preferably made from a resilient material, is the fact the resilience of the material makes it possible to place the sleeve member in various positions, in which the extent to which the longitudinal edges of the continuous slit overlap varies with each different position. In other words, the effective diameter of the sleeve member can be varied by reducing or increasing the extent to which the longitudinal edges overlap in dependence on the diameter of a respective cable being passed through. It is noted that the term "permanent overlap" in this connection is understood to mean that the longitudinal edges of the continuous slit do not automatically spring back from the position in which they

overlap to a position in which they no longer overlap and consequently lie opposite each other, for example due to stresses in the material. As already said before, the sleeve member or hose member can be deformed in such a manner that

5 the longitudinal edges of the continuous slit take up a desired overlapping position and remain in that position, which position corresponds to a diameter of a respective cable passed through the wall opening. Several cables, tubes or the like may be drawn through by one hose member.

10

In one preferred embodiment of the system according to the invention, the longitudinal edges overlap 1 - 5 cm, in particular 2 - 4 cm. Experiments have shown that this makes it possible to use the sleeve member with practically any

15 cable diameter.

In another preferred embodiment of a system according to the invention, the fire-resistant sleeve member is at least substantially made from a fire-resistant rubber. The rubber

20 is an elastomer or a plastomer, in particular EVA rubber, EVA standing for Ethylene/Vinyl/Acetate. In a preferred variant, the fire-resistant rubber can expand under the influence of heat, so that a sufficient degree of "tightness" is realised in the opening. A further important advantage of said the
25 expansion is the fact that a longer and thus more fire-resistant "bushing mass" is obtained.

In another preferred embodiment of a system according to the invention, several second fire-resistant sleeve members are

30 provided, which sleeve members extend in the same direction as the first sleeve member arranged round said at least one cable, tube or the like and which fill the remaining space in

the opening. As a result of the presence of said "fire-resistant filling means" a sufficient degree of air inclusion in the opening, and thus a high thermal insulation, is obtained. In particular, said first and said second sleeve
5 members are identical, so that only one type of sleeve member or hose member is present at the building site, which facilitates and simplifies the installation of the present system considerably.

10 In another preferred embodiment of a system according to the invention, said second fire-resistant sleeve members are at least substantially made from a fire-resistant rubber, and they are bonded together. The rubber is preferably of the kind as already explained above with regard to the first
15 sleeve member. The bonding together into one "unit" of the sleeve members functioning as "fillers" leads to the advantage that the remaining space in the opening does not need to be filled with the hose members one by one, but that said space can be filled with only one or a few "units",
20 which considerably enhances the efficiency of the installation. This aspect of the invention may also be applied independently of the specific embodiment of the aforesaid sleeve member, for example in the system disclosed in the aforesaid European patent publication No 0 534 563,
25 and consequently it constitutes an invention that may be claimed separately.

In another preferred embodiment of a system according to the invention, a heat-resistant and/or liquid-repellent material
30 is provided, which material is sealingly arranged on at least one open side of the opening. Said heat-resistant and/or liquid-repellent sealing putty enhances the liquid-tightness

and gas-tightness of the system. Preferably, said putty is expandable under the influence of heat.

A method for passing at least one cable, tube or the like through an opening in a wall, using a system according to the invention, comprises the following steps:

- passing said at least one cable, tube or the like through the opening,
- arranging a sleeve member comprising a continuous slit whose longitudinal edges overlap permanently under material stress at least in part round a portion of said at least one cable, tube or the like present, at least in part, in said opening.

The method preferably also comprises the step of filling the remaining space in the opening with second sleeve members or hose members, as well as the step of sealingly providing a heat-resistant and/or liquid-repellent material on at least one open side of the opening.

The invention will now be explained in more detail with reference to figures illustrated in a drawing, in which:

- Figure 1 is a schematic, perspective view of a preferred variant of a system according to the invention;
- Figure 2 is a schematic, perspective view of a hose member used in the system of Figure 1, which hose member is arranged round a cable being passed through; and
- Figure 3 shows several bonded-together hose members used as fillers in the system of Figure 1.

Figure 1 shows a frame 1 which is mounted in an opening formed in a steel deck or bulkhead of a vessel. The frame 1 comprises a flange 2, which lies in the plane of the steel deck and which functions as a support. After the frame 1 has
5 been sealingly mounted in the opening, electric lines 3 having varying diameters are drawn through the frame 1. Following that, a sleeve 4 of a fire-resistant rubber according to the invention is arranged round each electric line 3. Said arranging of the round cables having varying
10 diameters is easier when said one type of sleeve 4 is used, since the sleeves 4 are provided with a continuous slit 5, whose longitudinal edges 7 overlap, as will be explained in more detail yet with reference to Figure 2. Then the remaining space in the frame 1 is filled with sleeves 9 of
15 the same type of fire-resistant rubber. Finally, a heat-resistant and/or water-repellent sealing putty 6 is provided on both open sides of the frame 1. Said putty 6 has been selected because it has good bonding properties and because it will cure into a rubbery material within 24 hours as a
20 result of the atmospheric humidity. Preferably, the putty 6 is expandable under the influence of fire. The heat-resistant and/or water-repellent putty 6 guarantees a watertight and gastight bushing of the electric lines 3. It is noted that the sealing putty 6 is partially left out in Figure 1 so as
25 not to complicate Figure 1 unnecessarily.

Figure 2 shows that the effective diameter of a sleeve 4 can be adapted to the diameter of a respective electric line 3 by changing the degree of overlap of the longitudinal edges 7
30 accordingly. The resilience of the fire-resistant rubber is such that the longitudinal edges 7 will not automatically spring back when the desired degree of overlap is reached and

will remain in said desired position, therefore. The distance by which the longitudinal edges overlap and along which the sleeve 4 has a double thickness, therefore, ranges in particular from 2 to 4 cm. In order to avoid said double thickness, it is preferred to make the longitudinal edges 7 conical, so that they will have a joint thickness equal to a normal thickness of the sleeve 4 in the position in which they overlap.

10 Figure 3 shows a group of six bonded-together sleeves 9 forming one "unit", which function to fill the remaining space in the opening of the frame 1. This enables quicker and simpler filling of said space, since it is no longer necessary to place the sleeves into said space one by one as
15 was previously the case. The sleeves 9 are provided with an adhesive at their contact surfaces 8 and do not have a continuous slit.

The invention is not limited to the preferred variant as
20 shown, but it also extends to other variants that fall within the scope of the appended claims.

CLAIMS

1. A fire-resistant system for passing at least one cable,
tube or the like through an opening in a wall, which
5 system comprises a fire-resistant sleeve member
comprising a continuous slit, which is arranged at least
in part round said at least one cable, tube or the like,
and which is installed at least in part in said opening,
characterized in that the sleeve member can be placed in
10 a position in which longitudinal edges of said slit
overlap permanently under material stress.
2. A fire-resistant system according to claim 1, wherein
the longitudinal edges overlap 1 - 5 cm, in particular 2
15 - 4 cm.
3. A fire-resistant system according to claim 1 or 2,
wherein the fire-resistant sleeve member is at least
substantially made from a fire-resistant rubber.
20
4. A fire-resistant system according to claim 1, 2 or 3,
wherein several second fire-resistant sleeve members are
provided, which sleeve members extend in the same
direction as the first sleeve member arranged round said
25 at least one cable, tube or the like and which fill the
remaining space in the opening.
5. A fire-resistant system according to any one of the
preceding claims 1 - 4, wherein said second fire-
30 resistant sleeve members are at least substantially made
from a fire-resistant rubber, and they are bonded
together.

6. A fire-resistant system according to any one of the preceding claims 1 - 5, wherein a heat-resistant and/or liquid-repellent material is provided, which material is sealingly arranged on at least one open side of the opening.

7. A method for passing at least one cable, tube or the like through an opening in a wall, using a system according to any one of the preceding claims 1 - 6, which method comprises the following steps:

- passing said at least one cable, tube or the like through the opening,
- 15 - arranging a sleeve member comprising a continuous slit whose longitudinal edges overlap permanently under material stress at least in part round a part of said at least one cable, tube or the like being present, at least in part, in said opening.

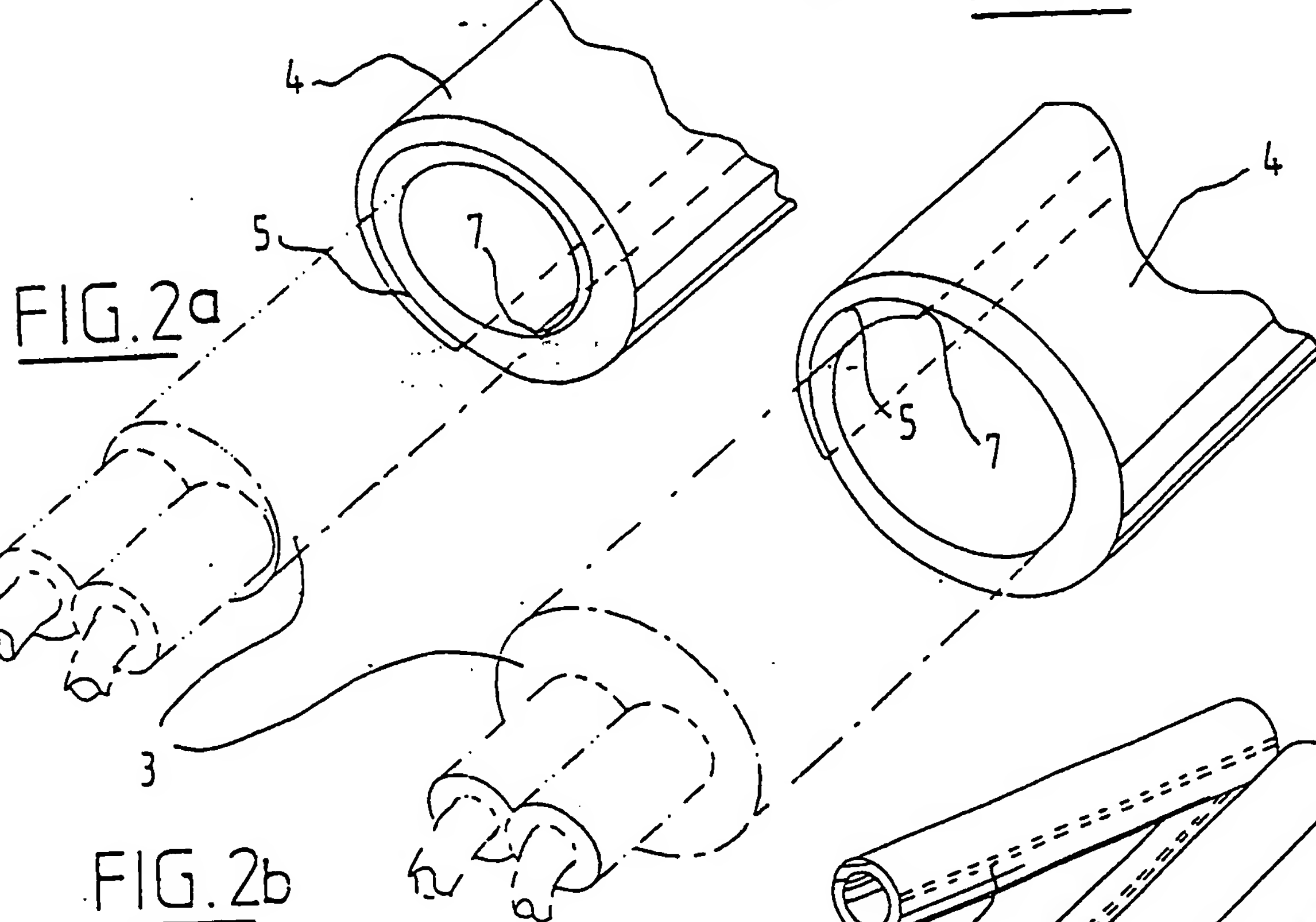
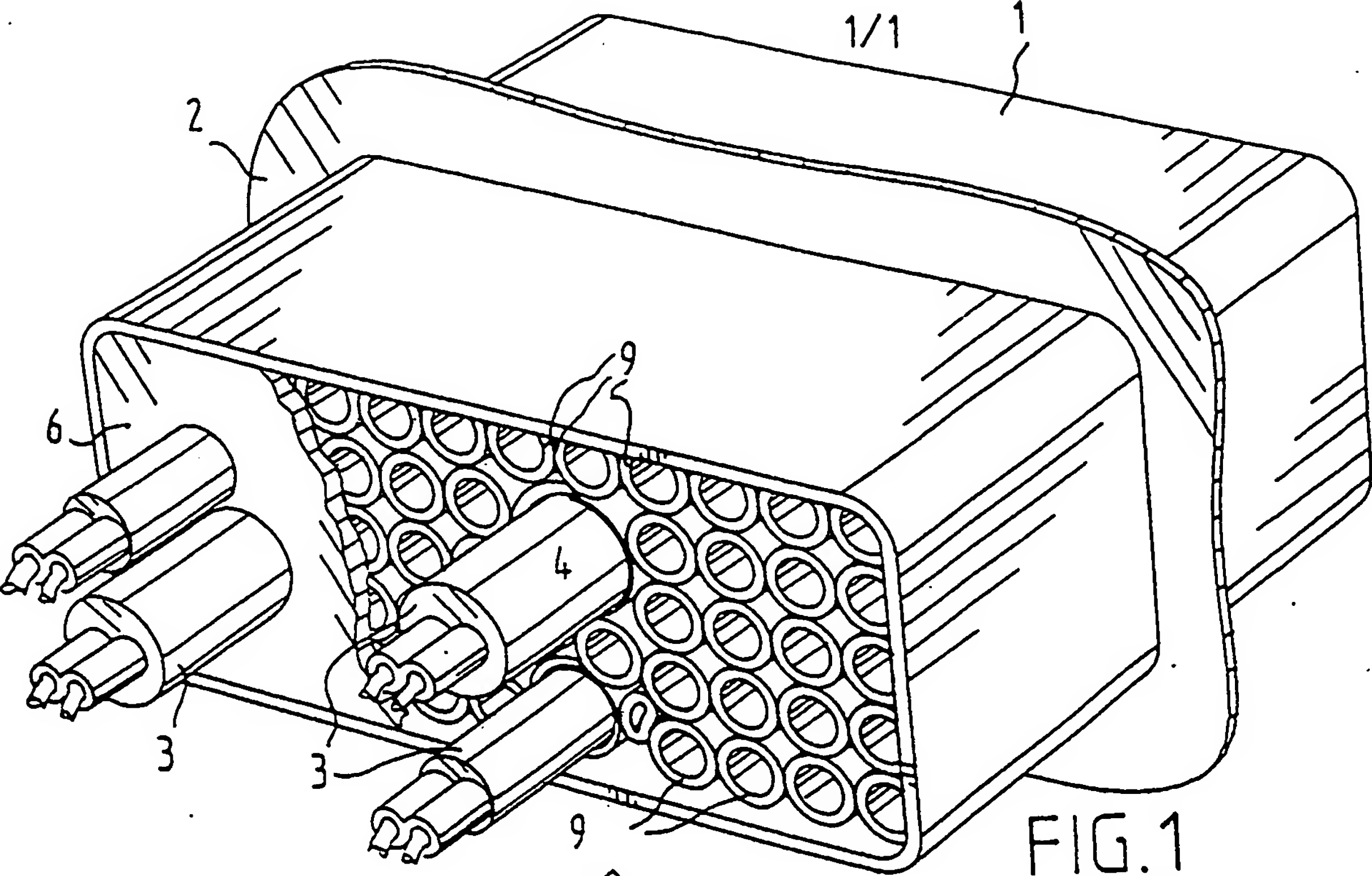
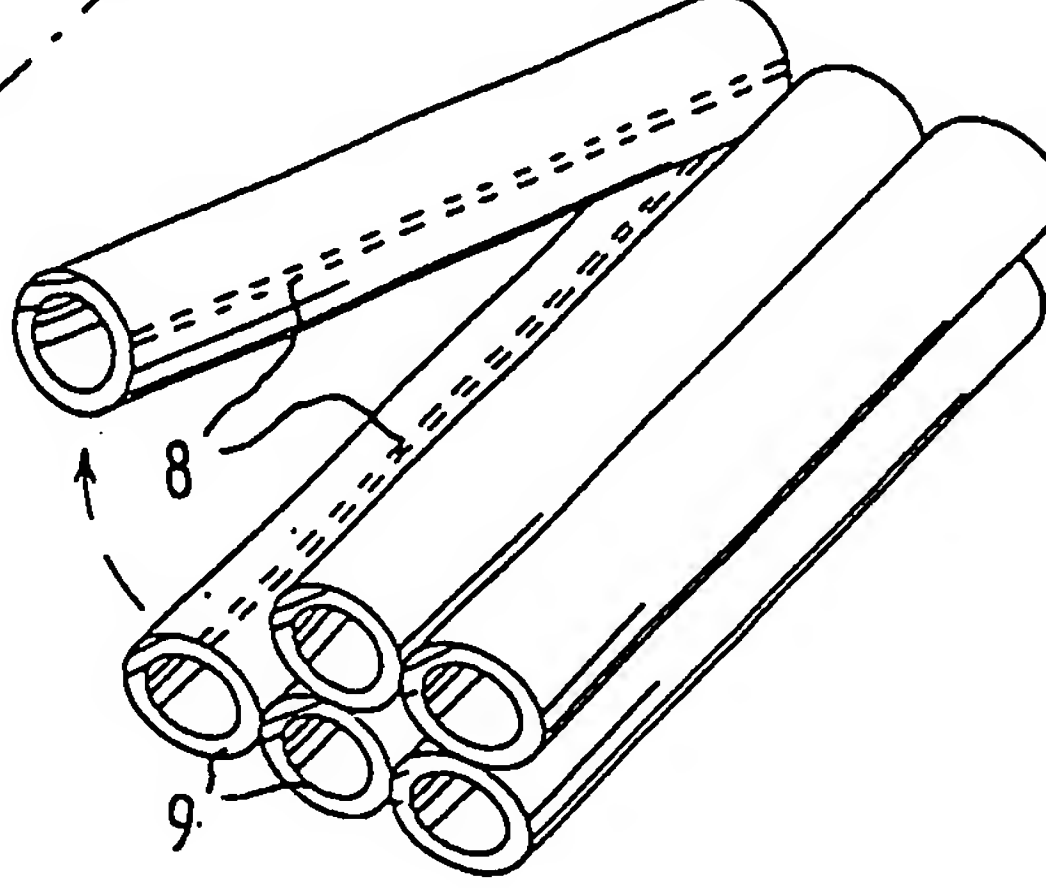


FIG. 3



INTERNATIONAL SEARCH REPORT

PCT/NL 02/00529

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A62C3/16 H02G3/22 F16L5/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A62C H02G F16L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 534 563 A (CSD INT BV) 31 March 1993 (1993-03-31) cited in the application the whole document ---	1-7
A	US 5 465 759 A (CARLSON DOUGLAS W ET AL) 14 November 1995 (1995-11-14) ---	
A	DE 197 25 301 A (SCHIANO PETER) 14 January 1999 (1999-01-14) ---	
A	DE 37 24 744 A (MINNESOTA MINING & MFG) 2 February 1989 (1989-02-02) -----	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

7 November 2002

Date of mailing of the international search report

20/11/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Triantaphillou, P

INTERNATIONAL SEARCH REPORT

PCT/NL 02/00529

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0534563	A	31-03-1993	NL	9101637 A	16-04-1993
			DE	69201040 D1	09-02-1995
			DE	69201040 T2	11-05-1995
			EP	0534563 A1	31-03-1993
			JP	3295140 B2	24-06-2002
			JP	6323471 A	25-11-1994
			US	5344106 A	06-09-1994

US 5465759	A	14-11-1995	DE	19509161 A1	28-09-1995
			FR	2717882 A1	29-09-1995
			GB	2287733 A	27-09-1995

DE 19725301	A	14-01-1999	DE	19725301 A1	14-01-1999

DE 3724744	A	02-02-1989	DE	3724744 A1	02-02-1989

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☒ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☒ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER: _____**

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.